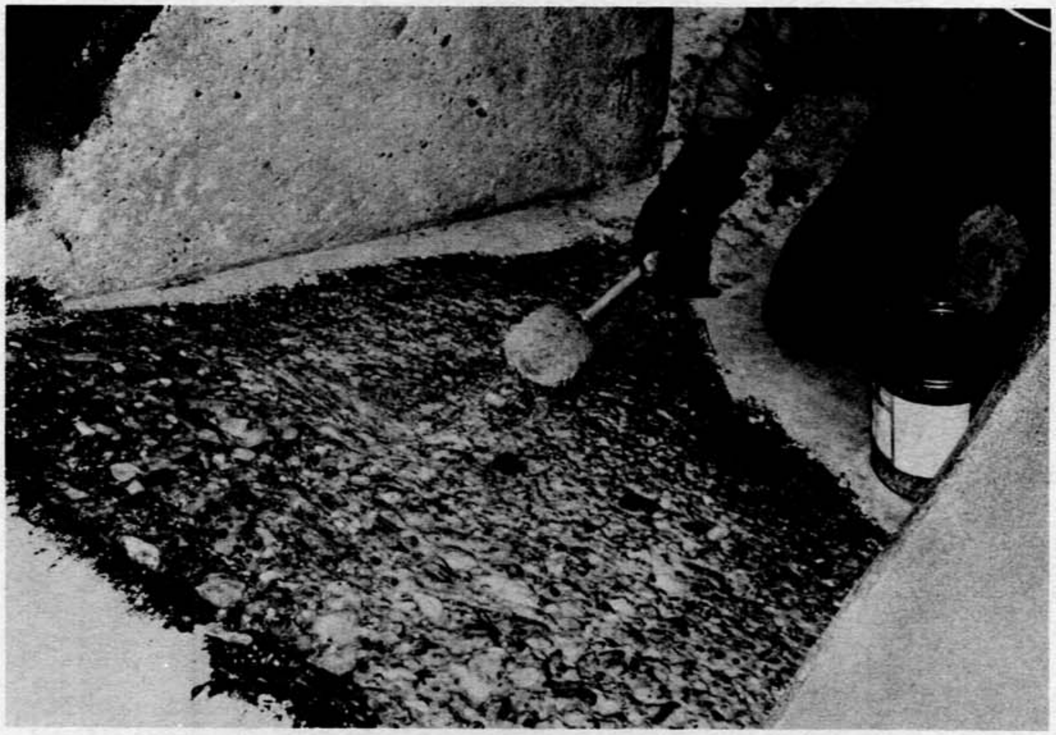
WATER OPERATION AND MAINTENANCE

BULLETIN NO. 76

JUNE 1971



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UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

WATER OPERATION AND MAINTENANCE
BULLETIN NO. 76

June 1971

INTRODUCTION

It has been some time since an article on concrete repair was presented in the Bulletin. Starting on page 1 is a summary of the most recent methods specified by the Bureau of Reclamation for the repair of eroded and cavitated concrete on a sluiceway and stilling basin at a dam in Montana. Similar procedures for concrete repair elsewhere have provided good results.

On page 17 is a suggestion for the protection of fire extinguishers. The idea was presented by an employee of the Weber Basin Civilian Conservation Center and reports indicate that these fire-extinguisher safety boxes as suggested have proven to be more than satisfactory.

A new canal joint sealing apparatus is now being used by the Northern Colorado Water Conservancy District, Loveland, Colorado. An article on page 18 describes this device that is both practical and economical.

Five good driving habits to follow for maximum road safety can be found on page 22.

A printed form used by a water district in reporting pipeline failure and repair is shown on page 23. The purpose of the form is described at the bottom of the preceeding page.

CONCRETE SLUICEWAY 1/
AND
STILLING BASIN REPAIR

General

The repair of concrete in a sluiceway and stilling basin at a large concrete dam in Montana was completed recently. The repairs were necessary because of abrasion of sand and gravel and cavitation from the action of high-velocity water. Concrete, epoxy-bonded concrete, and epoxy-bonded epoxy mortar were used. The work in the sluiceway was performed by contract and the work in the overflow weir stilling basin was performed by O&M personnel. All work was done by skilled workmen in the presence of experienced supervisors and inspectors. Several photographs of the concrete before and after repair are shown appropriately in the article. Figure 1 below shows an overall view of Yellowtail Afterbay Dam with sluiceway in foreground and overflow weir sections in background. This is the area in which the concrete repair work was performed.

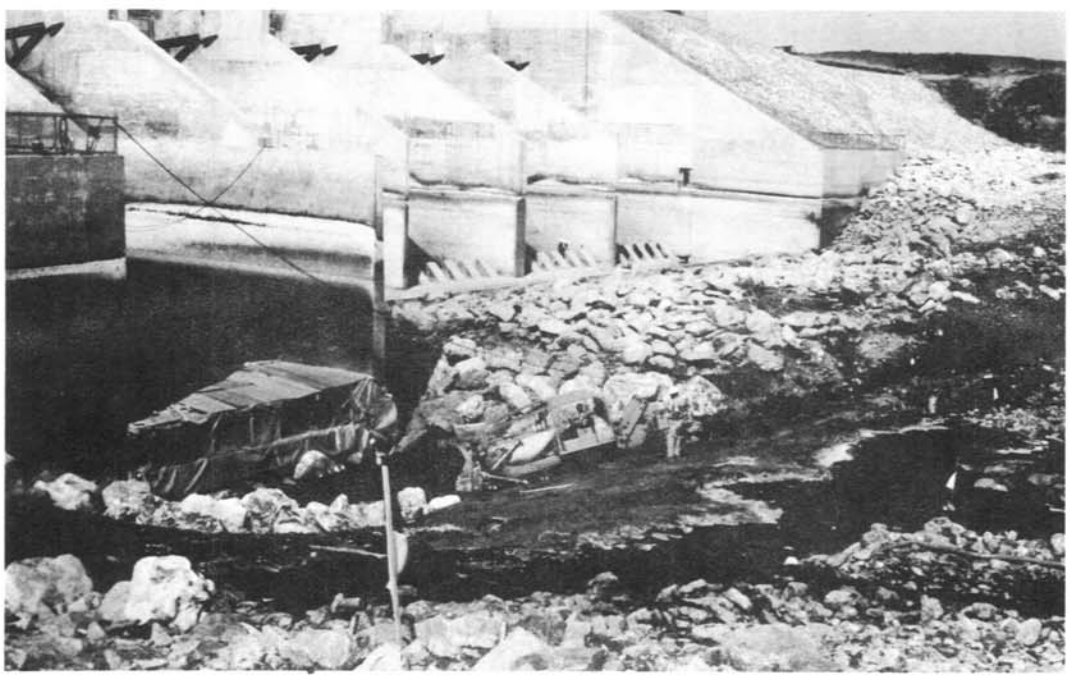


Figure 1. Photo P459-D-68901

1/ James R. Graham, Supervisory Civil Engineer, Concrete Section, Concrete and Structural Branch, Division of General Research, U.S. Bureau of Reclamation, E&R Center, Denver, Colorado.

Selection of Repair Method

The damaged concrete varied considerably as shown in Figures 2, 3, and 4 on pages 3, 4, and 5. The specifications required one of the three methods of repair, depending upon the depth and area of the damage. Specifications for the work stipulated:

1. When the depth of the area to be repaired exceeded 6 inches and was of an appreciable continuous area, repairs were to be made by bonding concrete to the area to be repaired without use of a bedding layer of epoxy-bonding agent, mortar or grout. Freshly mixed concrete was to be placed directly upon or against the existing in-place concrete after removal of damaged surface material and careful cleanup of the surface.

2. When the depth of the repair was between 1-1/2 and 6 inches, epoxy-bonded concrete was to be used. An epoxy bond coating or layer was to be spread over the area to be repaired after proper cleanup but before placement of freshly mixed concrete.

3. When the depth of repair was less than 1-1/2 inches, epoxy-bonded epoxy mortar was to be used. This consisted of the application of an epoxy bond coat or layer as in 2. above, followed by placement of an epoxy mortar composed of a mixture of sand and an epoxy-bonding agent, as shown in the cover photograph.

Preparations for Repair Work

Surface preparation. - It was required that surfaces of concrete to be repaired to which concrete was to be bonded without use of an epoxy-bonding agent must be clean, rough, and dry when concrete was applied. It was also required that all damaged and loosened or unbonded portions of existing concrete first be removed, after which the surfaces of the existing concrete were to be wet sandblasted, cleaned, and allowed to dry throughly. In the process of sandblasting, care was to be taken to prevent undercutting of aggregate in the existing concrete.

Cleaning was to be done by air-water jets followed by drying of the surface. Drying by air jet was permitted; however, compressed air used in cleaning and drying operations was to be free from oil or other contaminating materials.

After the surfaces had been prepared and thoroughly cleaned immediately following sandblasting, it was required that they be kept in a clean dry condition until the placing of the concrete had been completed, as shown in Figure 5 at the top of page 6. It was required that any contamination, oil, solvent, dirt accumulations, or foreign material which

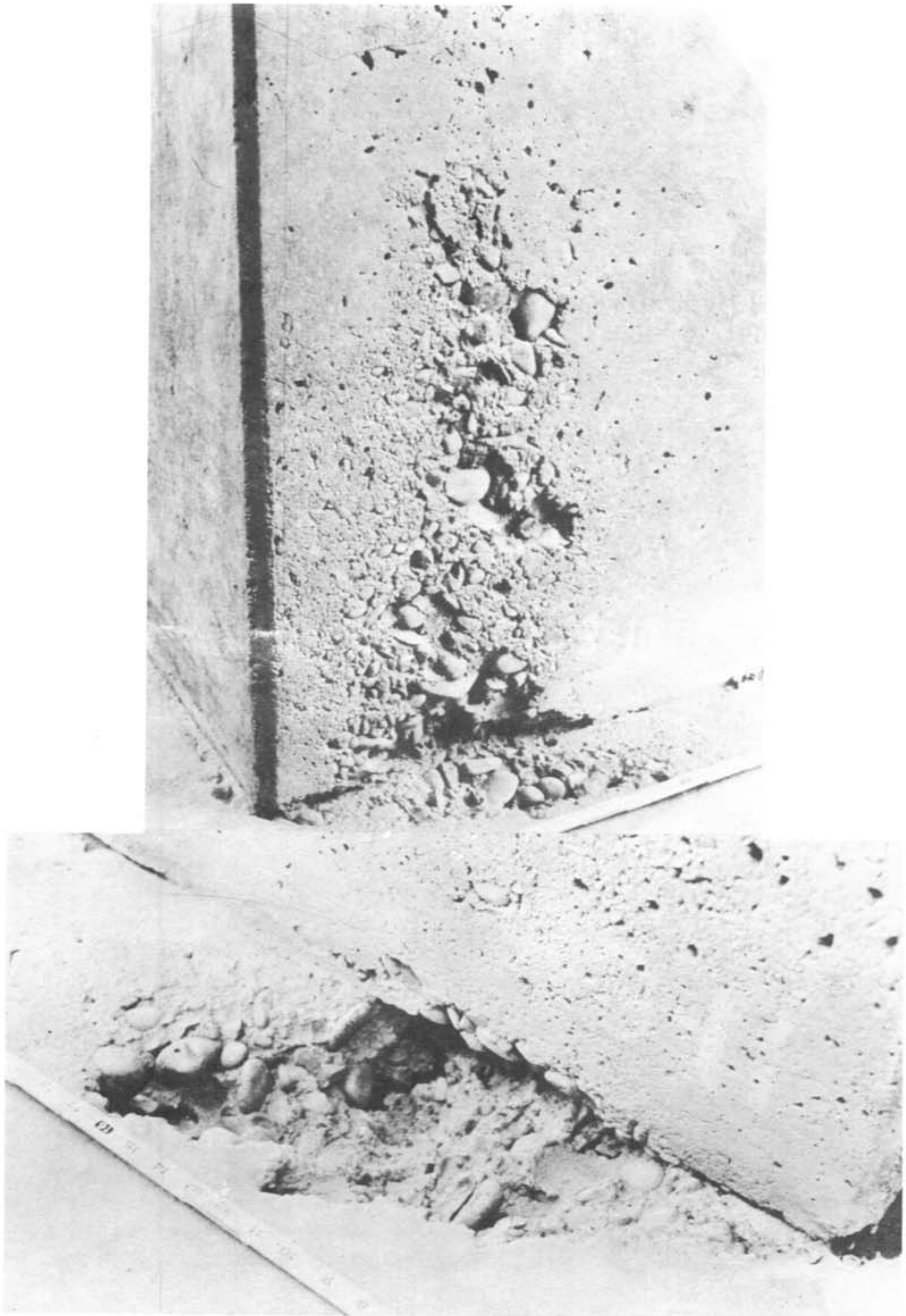
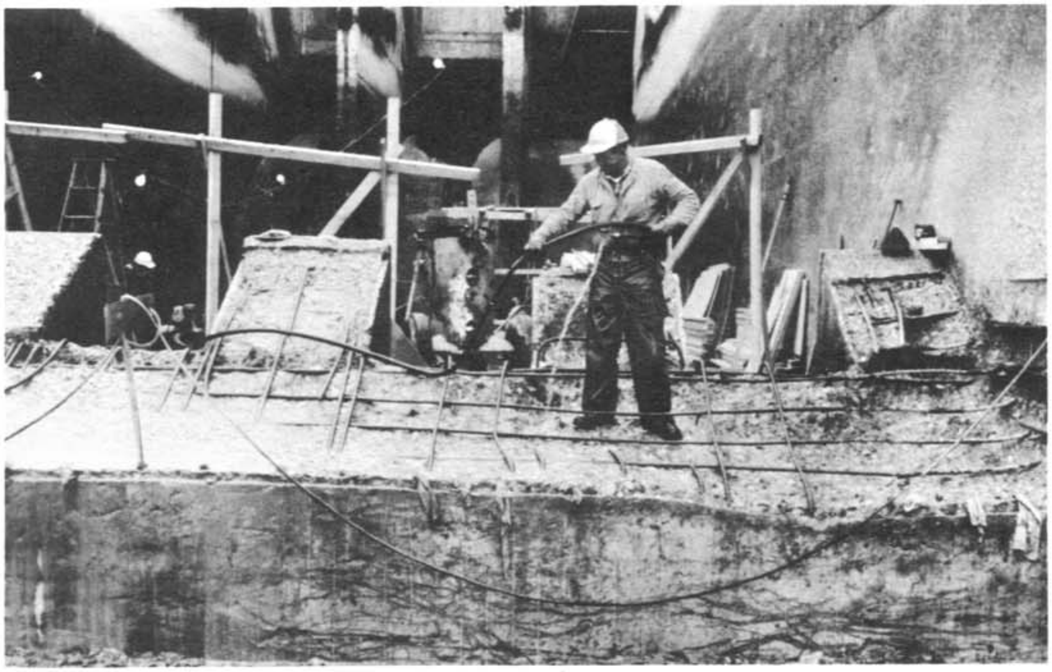


Figure 2. - Views of dentates in overflow weir stilling basin showing typical cavitation damage. Photos P459-D-68902 and P459-D-68903



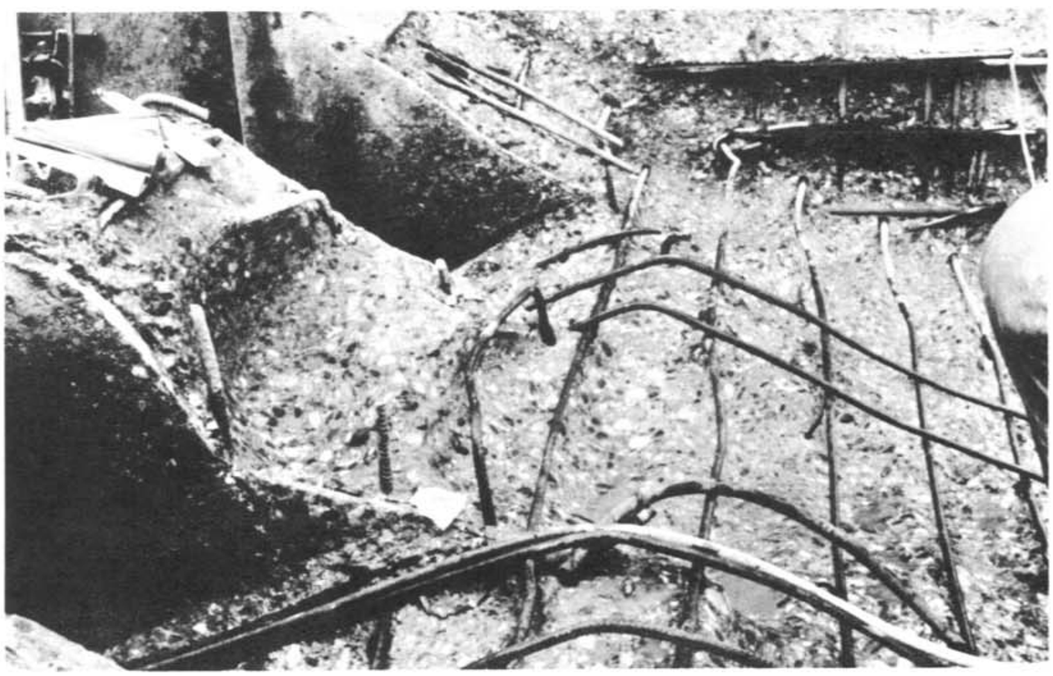


Figure 3. Views of abrasion damage on and around the dentates in the afterbay dam sluiceway. Photos P459-D-68904 and P459-D-68905

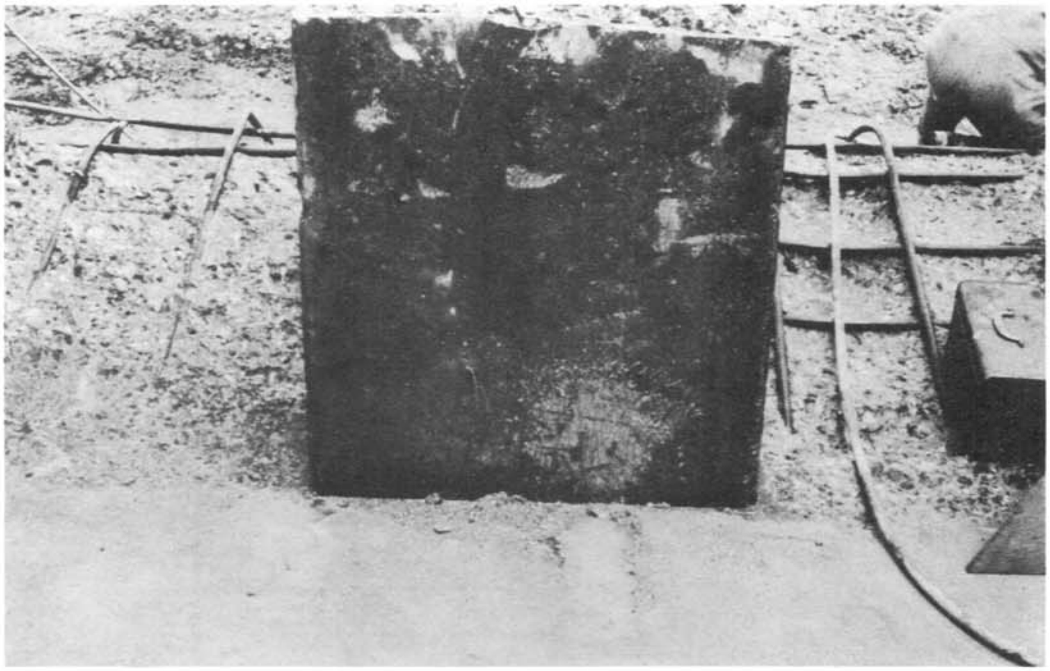


Figure 4. - View of abrasion damage to floor areas between sluiceway dentates (top photograph), and near toe of inclined section of sluiceway (bottom photograph). Photos P459-D-68906 and P459-D-68907

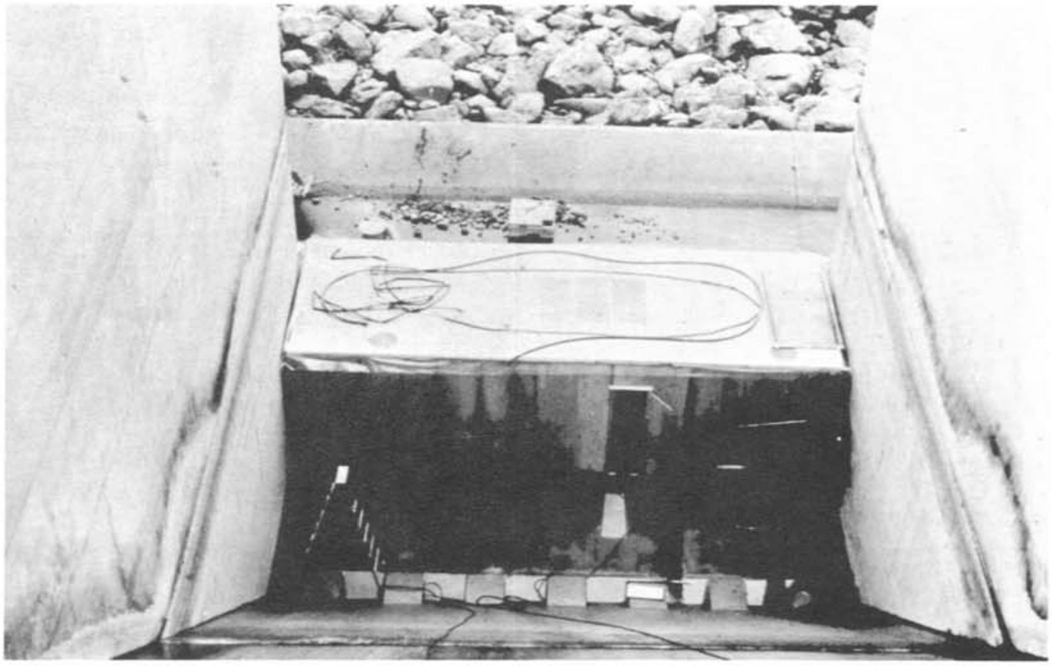


Figure 5. A view of shelter for use in making epoxy repairs in weir sections. Photo P459-D-68908

might occur must be removed by additional wet sandblasting and air-water jet cleanup followed by drying prior to bonding of the concrete.

The surfaces of existing concrete to which concrete or mortar was to be epoxy bonded were prepared and maintained in a clean condition in accordance with the above paragraphs, except that wet or dry sand-blasting and cleaning by air or water jets were permitted.

Forms. - Forms for concrete and epoxy-bonded concrete were to conform to the applicable Bureau requirements, in that they were to be sufficiently tight to prevent loss of mortar from the concrete and maintain their position rigidly until the concrete had hardened sufficiently to permit form removal without damage to the concrete.

Forms were required to provide an edge for new concrete to which epoxy mortar was later to be bonded, with the edge surfaces to be approximately normal to the required curvature when curved finished surfaces were involved. Forms also were required where necessary to prevent slumping or sagging of finished epoxy-bonded epoxy mortar. Such forms were to be covered with cellophane or polyethylene film and use of form oil was not permitted.

Anchor bars. - Where needed, holes were drilled into the existing concrete and reinforcement bars for anchoring new concrete were epoxy-bonded in the existing concrete. The holes were drilled, cleaned, and dried thoroughly before filling with sufficient epoxy-bonding agent to assure that a slight excess was squeezed out of the holes when the reinforcement bar anchors were fully inserted. To avoid air pockets in the holes, the specifications required that the holes be filled by injecting the epoxy-bonding agent to the bottoms of the holes by means of a squeeze bottle and tube or by any other method that would provide similar results. It was also required that the anchor bars be worked sufficiently to assure escape of air pockets and that suitable packing be placed about the bars at the surface of the concrete to prevent the epoxy-bonding agent from flowing out of the drilled holes. See Figure 6 on next page.

Safety precautions. - Certain safety precautions are necessary when using epoxy-resin materials. The specifications required that: skin contact be avoided; protective clothing and rubber or plastic gloves be worn by all persons handling epoxy materials; exposed skin areas be protected with a protective barrier cream; ventilation be provided and maintained at all times during use of epoxy and epoxy solvents; fans used for ventilating be explosionproof; if necessary, respirators which filter organic fumes and mists be worn, all epoxy-contaminated materials such as wipes, empty containers, waste material, etc., be continually disposed of in containers which are protected from spillage; and epoxy spillage be immediately and thoroughly cleaned up.

Materials

Epoxy-bonding agent. - It was specified that the epoxy-bonding agent must meet the requirements of Federal Specification MMM-B-350a, for Binder, Adhesive, Epoxy Resin, Flexible, Type I or II, depending upon application temperature. Type I was to be used only when the temperatures of the concrete to receive the epoxy were above 70° F, but less than 105° F. When the concrete temperatures were lower than 70° F, but in no case less than 50° F, Type II was to be used. Epoxy materials were to be stored at 70° F minimum to 90° F maximum.

Sand and coarse aggregate. - Sand and gravel for the concrete were required to conform to the usual Bureau standards of quality and be clean, hard, dense, durable, and uncoated. Coarse aggregate for the epoxy-bonded concrete was limited to 3/4-inch maximum size and limited to placement in relatively shallow areas. Although minor adjustments in the grading of sand for epoxy mortar were made on the job as required to provide a suitable epoxy mortar, the sand for epoxy mortar conformed to specification requirements in that it was clean, dry, well-graded, and composed of sound particles passing a No. 16 screen and conformed to the following specification limits:

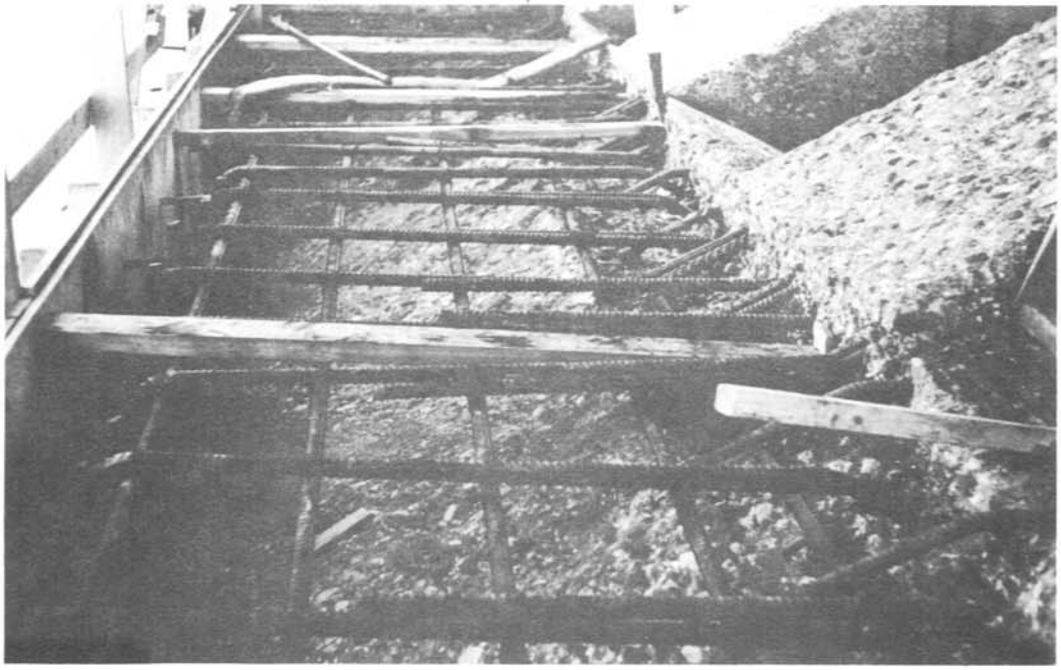


Figure 6. - View of reinforcing steel just prior to placement of sill modification concrete (top photograph), and concrete placement (bottom photograph).
Photos P459-D-68909 and P459-D-68910

Screen No.	Individual percent by weight, retained on screen
30	26 to 36
50	18 to 28
100	11 to 21
Pan	25 to 35

It was also required that sand for epoxy mortar be maintained in a dry area at not less than 70° F temperature for 24 hours immediately prior to time of use.

Air-entraining agents. - The specifications required that epoxy-bonded concrete applied to hydraulic flow surfaces contain sufficient air-entraining agent to extrain 3, plus or minus 1, percent of air, by volume of concrete, as discharged from the mixer.

Concrete Repairs

Mixing. - The concrete was composed of cement, sand and coarse aggregate, air-entraining agent, and water, all well mixed and brought to the proper consistency. The use of calcium chloride was not permitted. The net water-cement ratio of the concrete (exclusive of water absorbed by the aggregates) was not permitted to exceed 0.47, by weight. Slump of the concrete, when placed, was not to exceed 2 inches for concrete in slabs that were horizontal or nearly horizontal and 3 inches for all other concrete; and was not to exceed 1 inch for epoxy-bonded concrete.

The concrete ingredients were mixed in a mobile rubber-mounted mixer for not less than 2 minutes after all the ingredients, except the full amount of water, were in the mixer. The mixing time could be increased when the charging and mixing operations failed to produce a concrete batch throughout which the ingredients were not uniformly distributed and the consistency was not uniform.

Placing and finishing. - Concrete to be bonded without use of an epoxy-bonding agent was placed on the dry prepared surface and finished following standard practices. That is, concrete was spread evenly to a level slightly above grade and compacted thoroughly by vibrating and/or tamping. Tampers were sufficiently heavy for thorough compaction. After being compacted and screened, unformed concrete was given a wood-float finish, followed by a steel trowel finish. The addition of water, cement, or a mixture of dry cement and sand was not permitted on the surface of the concrete. Troweling was performed at the proper time and with heavy pressure, and was such as to result in a smooth, dense finish, free from defects and blemishes. As the concrete continued to harden, the surface was given additional trowelings. The final troweling was performed after the surface had hardened to such an extent that no cement paste would adhere to the edge of the trowel; however, excessive troweling was not permitted.

Epoxy-bonded Concrete Repairs

Mixing. Specifications for epoxy-bonded concrete repairs required that the composition of the concrete and its mixing be similar to that required for concrete repair. The preparation of the surfaces to be repaired also were similar, except that it was required that the existing concrete be heated in sufficient depth, when and as necessary, so that the surface temperature, as measured by a surface temperature gage, would not drop below 65° F during the first 4 hours after placement of the epoxy bond coat. This required several hours of preheating with radiant heaters. It was further required that in no case during preheating should the concrete temperature exceed 200° F, and the final surface temperature at time of placing epoxy materials should be less than 105° F.

Preparation of epoxy-bonding agent. - The epoxy-resin-bonding agent specified for the work was a two-component material which required combination of components and mixing prior to use. Once mixed, the material had a limited pot life and was used immediately. The bonding agent was prepared by adding the hardener components to the resin component in the proportions recommended by the manufacturer, followed by thorough mixing. Since the working life of the mixture was dependent on the temperature (longer at low temperature, much shorter at high temperature), the quantity mixed at one time was applied and topped within approximately 30 minutes. The addition of thinners or diluents to the resin mixture to extend the pot life was not permitted by the specifications.

Application of epoxy-bonding agent. - Immediately after the epoxy resin was mixed, it was applied to the prepared, dry, existing concrete at a coverage of not more than 80 square feet per gallon, depending on surface conditions. The area of coverage per gallon of agent depended on the roughness of the surface to be covered. Specifications permitted the epoxy-bonding agent to be applied by any convenient, safe method, such as squeegee, brush, or roller, which would yield an effective coverage.

Spraying of the epoxy-bonding agent was only permitted if an efficient airless spray was used and the concrete surfaces to receive the agent were 70° F or warmer. Specifications also required the operator to wear a compressed air-fed hood if spray application methods were used and no other personnel were permitted closer than 100 feet downwind of the operator when spraying was being performed. The specifications permitted appropriate solvents to be used to clean tools and spray guns, but in no case were the solvents to be incorporated in any bonding agent. All tools were to be completely dried after cleaning before reuse.

During application of the epoxy-bonding agent, care was exercised to confine the material to the area being bonded, and to avoid excessive contamination of adjacent surfaces, although specifications required that the epoxy-bond coat extend slightly beyond the edges of the repair area to ensure coverage. It was also required that the applied epoxy-bonding agent film be in a fluid condition at the time the concrete was placed and, if the film cured beyond this state, but was still tacky, it was required that a new bond coat be applied over the first bond coat. Also, if any bond coat had cured beyond the tacky state, it was to be completely removed by sandblasting, proper cleanup accomplished, and a new bond coat applied.

Placing and finishing. - Epoxy-bonded concrete was placed and finished in a manner similar to that employed in the placement of concrete in repairs not requiring an epoxy-bonding agent. The use of epoxy-bonded concrete in repairs requiring forming, such as on steeply sloped or vertical surfaces, was only permitted when the forming required was such that the bonding agent could be applied and the concrete properly placed within the time period necessary to assure that the bonding agent was still fluid, or tacky where and as permitted under the specifications.

Epoxy-mortar Repairs

Mixing. - It was required that the epoxy mortar be composed of sand and epoxy-bonding agent suitably blended to provide a stiff, workable mix. The epoxy components were mixed prior to the addition of the sand, and in a manner similar to that used in mixing the epoxy-bonding agent for epoxy-bonded concrete described previously. The mix proportions were established, batched, and reported on a weight basis, but the specifications provided that the dry sand and mixed epoxy may have been batched by volume using suitable measuring containers that had been calibrated on a weight basis. Epoxy meeting Federal Specification MM-B-350a will, using a sand graded as given previously under materials, require approximately 5-1/2 to 6 parts of sand to 1 part epoxy, by weight. This is equivalent to a ratio of approximately 4 to 4-1/2 parts sand to 1 part epoxy, by volume. If equivalent volume proportions are used, care should be taken to prevent confusing them with weight proportions. The mix must be adjusted when necessary, for the particular epoxy and sand being used.

Specifications required that the epoxy mortar be thoroughly mixed with a slow-speed mechanical stirrer or other equipment that would produce equivalent results. As in the case of the epoxy-bonding agent, the mortar had to be mixed in small-sized batches so that each batch could be completely mixed and placed within approximately 30 minutes from the time the two components for the epoxy-bonding agent were combined. The addition of thinners or dilutents to the mortar mixture were not permitted.

Placing. - After the existing concrete to which epoxy mortar was to be bonded had been sandblasted, cleaned, and dried, the epoxy mortar was placed, finished, cured, and protected, in a manner similar to that used in placing any epoxy mortar. Epoxy-bonding agent was applied to the areas to be repaired immediately before placing of the epoxy mortar. Special care was taken to prevent the bond coat from being spread over concrete surfaces not having been properly cleaned and prepared.

The prepared epoxy mortar was tamped, flattened, and smoothed into place in all areas while the epoxy-bonding agent was still in a fluid condition, except that the specifications permitted the bond coat on steep slopes to be brought to a tacky condition, see Figure 7 below.

Figure 7. - View of the epoxy-mortar application. White mortar results from use of silica sand. Photo P459-D-68911

However, in the event that an applied film cured beyond the fluid or very tacky condition, specifications required that a second application of bonding agent be applied while the first bond coat was still tacky before the epoxy mortar was placed.

The mortar was worked to grade and given a steel trowel finish, as shown in Figure 8 on next page. Special care was taken at the edges of the area being repaired, particularly where thin featheredges were involved, to assure complete filling and leveling, and to prevent the

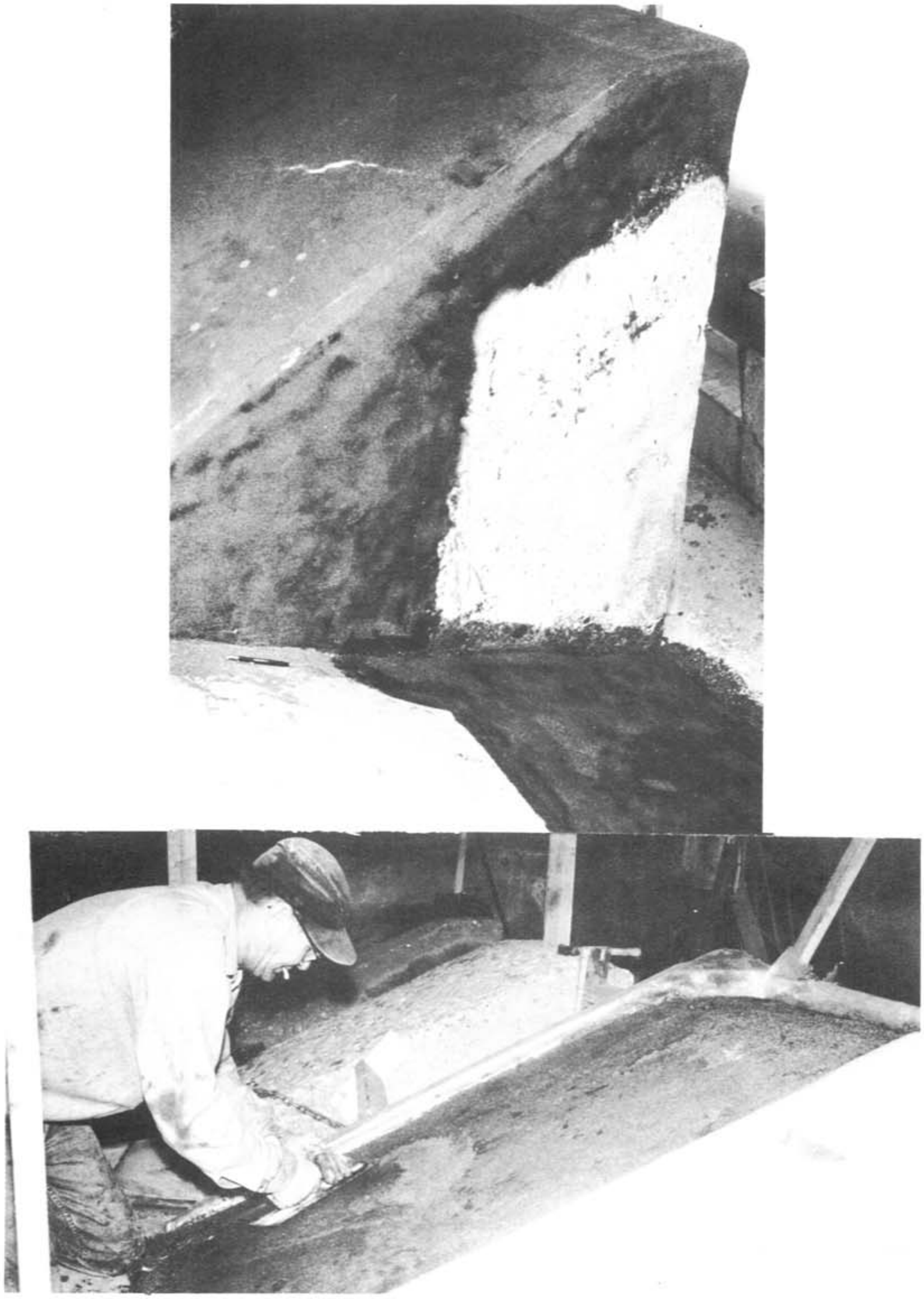


Figure 8. - Views of dentates in sluiceway during and after being repaired with epoxy-bonded epoxy mortar. Photos P459-D-68912 and P459-D-68913

mortar from being spread over surfaces not having the epoxy-bond coat application. Steel troweling was performed in a manner to best suit the prevailing conditions but, in general, was performed by applying slow, even strokes. Specifications permitted trowels to be heated to facilitate the finishing; however, the use of thinner, dilutants, water, or other lubricant on placing or finishing tools was not permitted, except for final cleanup of tools.

After leveling of the epoxy mortar to the finished grade, where precision surfaces were required on sloping surfaces, the mortar was covered with plywood panels smoothly lined with polyethylene sheeting and weighted with sandbags or otherwise braced, until danger from slumping had passed. It was required when polyethylene sheeting was used, that no attempt be made to remove it from the epoxy-mortar repair before final hardening. All areas of repair requiring featheredging was done using epoxy mortar.

Finished Surfaces

To avoid further cavitation of concrete due to the action of high-velocity water the specifications required that the surfaces of all concrete, epoxy-bonded concrete, and epoxy-bonded epoxy mortar repairs be finished to close tolerances as shown in Figure 9 on next page. It was required that final finished surfaces should conform to the following requirements:

> "(a) Abrupt irregularities, when tested by direct measurement, shall not exceed one-fourth of an inch for irregularities paralled to the direction of flow and one-eight of an inch for irregularities not parallel to the direction of flow.
>
> "(b) Gradual irregularities, when measured by templates, 5 feet in length for formed surfaces and 10 feet in length for unformed surfaces, shall not exceed one-fourth of an inch."

Curing and Protection

Temperature. - Because the area in which the work was done experiences cold weather early in the fall of the year, the specifications were very restrictive in the protection of the newly repaired concrete from low temperatures. The specifications required that "immediately following the first frost in the autumn, and until the mean temperature in the vicinity of the worksite falls below 40° F for more than 1 day, the concrete shall be protected against freezing temperatures for not less than 48 hours after it is placed. Whenever the mean daily temperature in the vicinity of the worksite falls below 40° F for more than 1 day, the concrete shall be maintained at a temperature not lower than 50° F for at least 72 hours after it is placed. Concrete cured by membrane will require no additional protection from freezing if the protection at 50° F for 72 hours is obtained by means of approved insulation in contact

Figure 9. - View of dentates in overflow weir stilling basin after completion of epoxy application (top photograph), and closeup of finished repair after grinding (bottom photograph). Photos P459-D-68914 and P459-D-68915

with the forms or concrete surfaces; otherwise, the concrete shall be protected against freezing temperatures for 72 hours immediately following the 72 hours of protection at 50° F. Concrete cured by water curing shall be protected against freezing for 3 days immediately following the 72 hours. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying."

Final curing. - Final curing of the concrete and epoxy-bonded concrete by water or covering with a membrane was permitted by the specifications. If it was to be by water it was to be by sprinkling or spraying for at least 14 days after placement to maintain the repaired surfaces in a continuously moist condition. If by membrane, the curing was to be by application of an approved sealing compound.

Postcuring of epoxy mortar. - The specifications required further care in the curing of epoxy-mortar repairs. They stated that "Epoxy mortar repairs shall be cured immediately after completion of each repair area at not less than 60° F until the mortar is hard. Postcuring shall then be initiated at elevated temperatures by heating in depth of the epoxy mortar and the concrete beneath the repair. Postcuring shall continue for a minimum of 4 hours, and a surface temperature of not less than 90° F nor more than 110° F shall be maintained. The heat shall be supplied by use of portable propane-fired heaters, batteries of infrared lamp heaters, or other approved methods, capable of and positioned such that the required surface temperatures are obtained. In no case shall epoxy-bonded epoxy mortar be subjected to moisture until after the specified postcuring has been completed."

If copies of the Bureau of Reclamation's "Standard Specifications for Repair of Concrete" are desired they are available from the Engineering and Research Center, Denver Federal Center, Attention: Code 922, Building 67, Denver, Colorado 80225.

* * * * *

Most boats today are inherently safe, and most boating accidents are caused by human error. About half the accidents involving injury reported to the Coast Guard in 1968 were collisions, usually caused by a failure to post a forward lookout. Capsizing causes the most deaths and is usually the result of the operator's overloading the boat, ignoring weather warnings, or taking the boat into waters exceeding its limits or the operator's experience. Most drowning victims are not properly using life preservers.

--The New York Times

FIRE-EXTINGUISHER SECURITY BOXES
(Suggestion No. R4-70S-5)

A suggestion for security boxes for fire extinguishers was made by Mr. Jack Card, Job Corps instructor, Weber Basin Job Corps, Utah. The container as suggested has been approved by the Utah State Fire Marshall and the Regional Safety Officer. During the year prior to installation of the security boxes, the Job Corps Center was experiencing from 8 to 12 unauthorized activations of fire extinguishers each week. Since the installation of the security boxes, 8 months ago, only four refills have been needed and all occurred as the result of authorized use.

The security boxes are made of wood with a pushout screen, as shown in the photograph below. The box is 28 inches high, 10 inches wide, and 10 inches deep. The pushout screen is made of mesh nylon which tears away with a minimum of pressure, it also provides see-through capability which permits easy inspection of extinguisher. Nylon can be either stapled or nailed to the removable front which is held in by two screws.

Photo P1077-D-68916

There are 75 of the fire extinguisher security boxes described above already installed at the Weber Basin Civilian Conservation Center, and it has been reported that they have proven highly satisfactory.

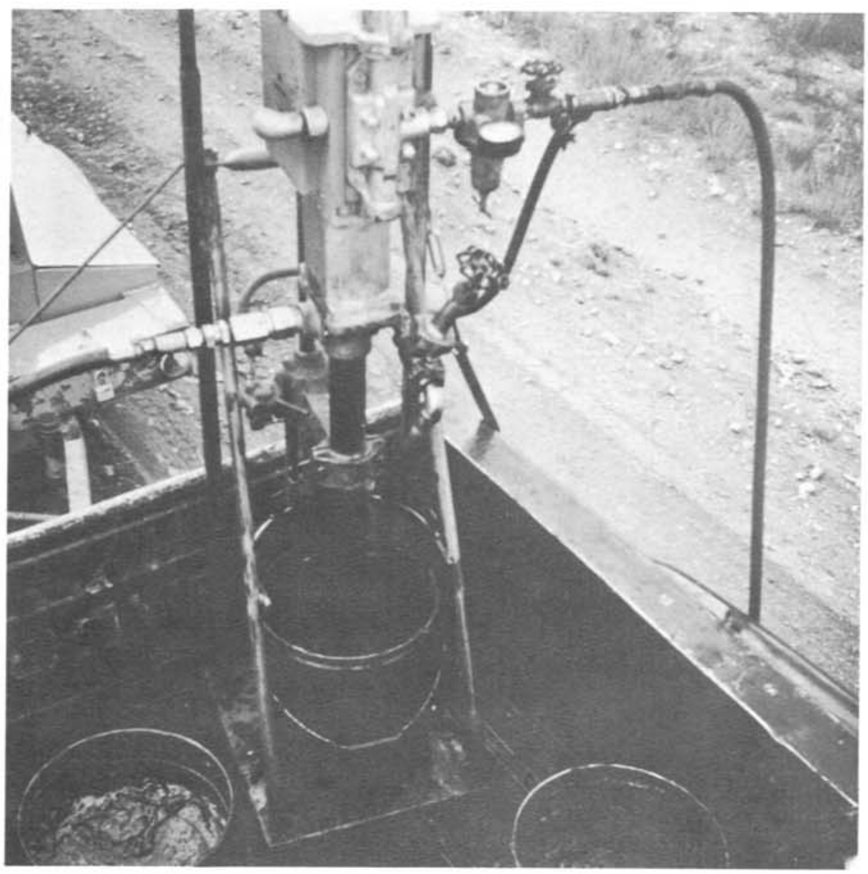
If additional information is desired regarding this suggestion, please write to: Weber Basin Civilian Conservation Center, Route 4, Ogden, Utah.

* * * * *

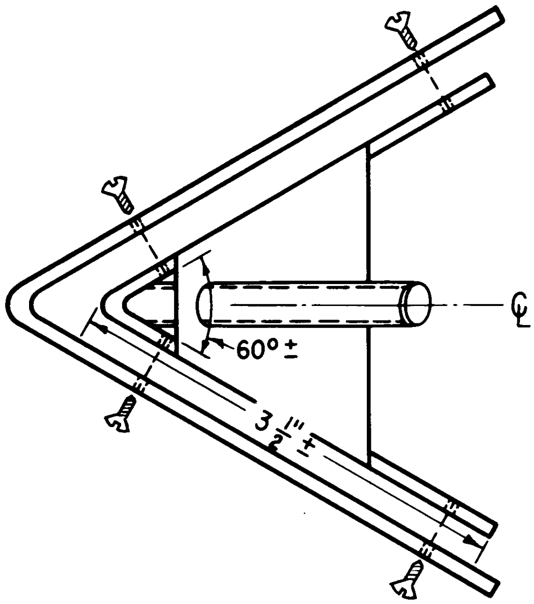
TROWEL SHOE FOR MASTIC JOINT SEALING COMPOUNDS

Personnel at the Northern Colorado Water Conservancy District in Loveland, Colorado, have developed a travel shoe for their canal joint sealing apparatus. This attachment, in the form of a plow is covered with two-ply automobile tire sidewall rubber, and is bent V shaped around the application nozzle, as shown in Figure 1 on the following page.

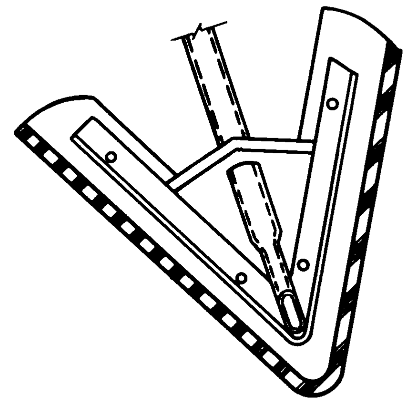
The equipment shown in Photograph 1 below, is used for applying single component rubberized asphalt mastic canal joint sealers of the type conforming to Bureau of Reclamation specifications. Photograph 2 on page 20, shows how an employee controls the flow valve on the applicator pipe, and Photograph 3 on the same page shows the plow-shaped shoe on the end of the applicator nozzle. The tire rubber affixed to the shoe extends 3/4-inch below the applicator nozzle, and during application only the rubber contacts the concrete.



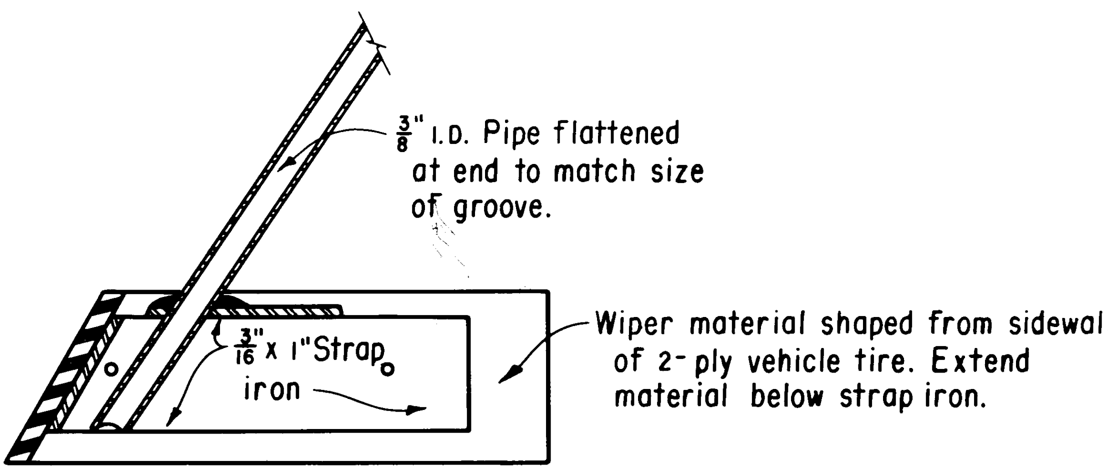
Photograph 1. Photo P245-D-68917



TOP VIEW OF SHOE SHOWING
WIPER MATERIAL NOT ATTACHED
NO SCALE



SKETCH SHOWING SHOE
FROM BELOW
NO SCALE



SECTION AT ℄ WITH WIPER
MATERIAL ATTACHED
NO SCALE

TROWEL SHOE FOR APPLICATION OF EXPANSION JOINT MATERIAL

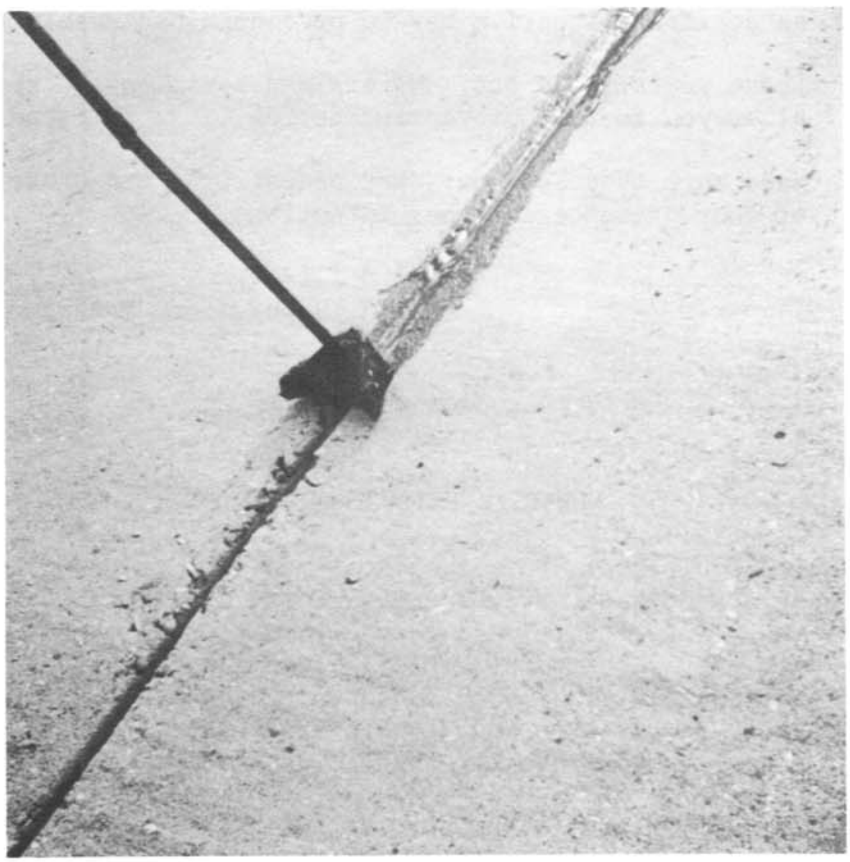
Figure 1

Photograph 2. Photo P245-D-68919

Photograph 3. Photo P245-D-68918

As shown in Photograph 4 below, the "plow" is drawn backwards as the mastic sealer is extruded, troweling away the excess material, tooling the surface, and assuring complete filling of the groove. By tilting the shoe the groove can be overfilled, underfilled, or finished flush with surface, whichever is desired.

This equipment is also used for applying a cap seal to random cracks, using the same mastic as for joint sealing.



Photograph 4. Photo P245-D-68920

If additional information is desired regarding this trowel show, please write to: Northern Colorado Water Conservancy District, Post Office Box 689, Loveland, Colorado 80537.

* * * * *

FIVE FOR THE ROAD

Mastering these five seeing habits will make you a safer driver:

1. Aim high in steering: High-aim steering is the safest way to guide your car in the proper path.
2. Get the big picture: You must know what is going on around you that may affect your own driving situation.
3. Keep your eyes moving: While you're gazing in one direction, an accident situation may be developing somewhere else.
4. Leave yourself an out: Maintain a position and speed that will allow you to take preventive action if an emergency develops.
5. Make sure they see you: Let pedestrians and other drivers know of your presence and your intentions.

Supervisory Management

* * * * *

A NEW PIPE FAILURE REPORT FORM

The Regional Director, Bureau of Reclamation, Region 2, Sacramento, California, reported that the Contra Costa County Water District, in Pittsburg, California, has recently introduced a new printed form which they require the employees to fill out when repairing pipeline failures. The form, as shown on the following page is used to analyze the type and trend of failures as well as provide a record of trouble areas for the District.

The form, adopted from one suggested by the American Water Works Association for investigation of pipeline failures, is used by them to update their records. It may be reproduced by other districts and adopted to their individual needs.

NO. ____________

WATER MAIN FAILURE REPORT

FIELD DATA FOR MAIN BREAK EVALUATION

DATE OF BREAK ____________ TIME: ________ A.M. ________ P.M.

TYPE OF MAIN: ____________ SIZE ________ JOINT ____________ COVER ____ FT. ____ IN.

THICKNESS AT POINT OF FAILURE ____________ INCH.

NATURE OF BREAK: Circumferential ☐ Longitudinal ☐ Circumferential & Longitudinal ☐ Blowout ☐ Joint ☐

Split at Corporation ☐ Sleeve ☐ Miscellaneous ____________ (describe) ☐

APPARENT CAUSE OF BREAK: Water Hammer (surge) ☐ Defective Pipe ☐ Corrosion ☐ Deterioration ☐

Improper Bedding ☐ Excessive Operating Pressure ☐ Differential Settlement ☐ Temp. Change ☐ Contractor ☐ Misc. ____________ (describe) ☐

STREET SURFACE: Paved ☐ Unpaved ☐ TRAFFIC: Heavy ☐ Medium ☐ Light ☐

TYPE OF STREET SURFACE ____________ SIDE OF STREET: Sunny ☐ Shady ☐

TYPE OF SOIL ____________ RESISTIVITY ________ ohm/cm

ELECTROLYSIS INDICATED: Yes ☐ No ☐ CORROSION: Outside ☐ Inside ☐

CONDITIONS FOUND: Rocks ☐ Voids ☐ PROXIMITY TO OTHER UTILITIES ____________

DEPTH OF FROST ______ INCH DEPTH OF SNOW ______ INCH

OFFICE DATA FOR MAIN BREAK EVALUATION

WEATHER CONDITIONS: PREVIOUS TWO WEEKS ____________

SUDDEN CHANGE IN AIR TEMP ? Yes ☐ No ☐ TEMP. ________ °F. RISE ________ °F. FALL ________ °F.

WATER TEMP.: SUDDEN CHANGE: Yes ☐ No ☐ TEMP. ________ °F. RISE ________ °F. FALL ________ °F.

SPEC. OF MAIN ____________ CLASS OR THICKNESS ________ LAYING LENGTH ______ FT.

DATE LAID ____________ OPERATING PRESSURE ______ PSI. PREVIOUS BREAK REPORTED ____________

INITIAL INSTALLATION DATA:

TRENCH PREPARATION: Native Material ____________ (describe type) ☐ Sand Bedding ☐ Gravel Bedding ☐

BACKFILL: Native Material ☐ DESCRIBE ____________ Bank Run Sand & Gravel ☐

Gravel ☐ Sand ☐ Crushed Rock ☐ OTHER ____________

SETTLEMENT: Natural ☐ Water ☐ Compactors ☐ Vibrators ☐ OTHER ____________ (describe)

ADDITIONAL DATA FOR LOCAL UTILITY USE

LOCATION OF BREAK ____________ MAP NO. ____________

REPORTED BY ____________

DAMAGE TO PAVING AND/OR PRIVATE PROPERTY ____________

____

REPAIRS MADE (Materials, Labor, Equipment) ____________

____

REPAIR DIFFICULTIES (If Any) ____________

____

INSTALLING CONTRACTOR ____________

JANUARY 15, 1969

GPO 836-043